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I and III occur together on the same leaf. The spermogonia were not observed. Possiby the *Æcidium* may be *Æcid. monoicum*, Pk., but the color of the spores is different and the cups are open almost from the first. The manner of growth is the same.

NOTES ON CERTAIN UREDINEÆ AND USTILAGINEÆ.

BY F. W. ANDERSON.

ÆCIDIUM CRASSUM, Pers., *Æcidium rhamni*, Pers., and *Æcidium pulcherrimum*, Ravenel, are identical, and are considered to be I of *Puccinia coronata*, Corda. In Sacc. Sylloge *Æcidium pulcherrimum* is retained, probably inadvertently, in specific rank, although it plainly belongs as above. No. 933 of de Thümen's Mycotheca Universalis, given as *Æcidium rhamni*, Persoon, is identical with Ravenel's specimen of *Æcidium pulcherrimum.*

NUMBER 1003 of Ellis's N. A. F. is *Æcidium ranunculacearum*, DC. But *b* of this number is *Æcidium ranunculi*, of Schweinitz. The most available, and as it appears to me fairly constant, points of distinction between these two species are as follows: *Æcidium ranunculacearum:* æcidia always in spots, preceded or accompanied by the spermogonia which are aggregated usually in the center of the æcidium spots. *Æcidium ranunculi*, Schweinitz: æcidia always effused, preceded or accompanied by the spermogonia, which are also effused and scattered, like the æcidia, indiscriminately over the surface of the leaf. Sometimes the leaf is thickly covered by the fungus and again it may bear only a cup here and there. The form of *Æcidium ranunculacearum* on *Ranunculus Cymbalaria*, so common at the West, at times shows some inclination to approach *Æcidium ranunculi* in its manner of growth, but after all never seems to lose entirely its specific characters.

ÆCIDIUM ALBUM, Clinton, in 26th Report of the New York State Museum for 1874 and *Æcidium porosum*, Peck, in Botanical Gazette, page 34, 1878, are identical. The two supposed species occur on the same host plants, and have constantly the same manner of growth from New York State to the Pacific Ocean. Herewith is given an amended description of this species: Spots none, cups few and scattered and almost superficial, or much crowded, in which case they appear to be deep-seated and give a porous appearance to the leaf surface; occupying a part or the whole of the lower surface of the leaves; frequently appearing on the stems also, in which situation they are hemispherical, or short-cylindrical, erumpent, and opening by a small, irregular, or roundish orifice. Spores from a bright orange color to almost colorless, very variable in this respect, subangular or roundish, oblong, oval or ovate, according to the free or crowded condition of the cups, 18 μ to 26 μ diameter. Saccardo in Sylloge, vol. 4, p. 787, says that *P. porosum* is distinct from *P. album*, but this can not be so.

ÆCIDIUM HELIOTROPI, Tracy and Galloway, is the same as *Æcidium biforme*, Peck, which was published first and therefore has precedence.

ÆCIDIUM PALMERI, n. s.

On *Pentstemon virgatus*. Willow Spring, Ariz., June, 1890, collected by Dr. Edward Palmer. Com. Dr. J. N. Rose.

Spots more or less elongated, but little paler than rest of leaf; a little or not at all thickened. Pseudoperidia not deep seated, amphigenous; usually numerous and closely set, but not crowded together; when first bursting the epidermis, ovate and nearly white, or with the faintest possible purple tinge; soon becoming cylindric-clavate, with rounded or ovate apex; twice to at least four times as high as broad, straight or slightly curved; becoming flesh-colored fading to white above and at last becoming reddish-orange and sometimes opening by a small central orifice in the rounded apex, but more frequently opening by the fragile, white, broadly and irregularly ovate, to deeply cleft, acute, erect marginal lobes, which latterly fall away, often irregularly, exposing to view the orange-colored spores which fill the tubes. Spores roundish or irregularly polygonal to ovate or oblong and variously compressed; smooth, or very minutely roughened, epispore thickish; spore contents granular, with numerous yellow oil globules which escape freely under pressure; usually there are also two or three deep yellow and variously shaped nuclei. Spores orange colored, $16-26 \times 16-23\ \mu$.

This well marked Æcidium is very distinct from *Æcidium pentstemonis*, Schwein.

PUCCINIA CLADOPHILA, Peck, on *Stephanomeria minor*, in Botanical Gazette February, 1879, page 127, is the same as *Puccinia Harknessii*, Vize, on *Lygodesmia*, in Grevillia, vol. 7, page 11, September, 1878. The latter has been referred to *Puccinia hieracii*, (Schum.) Mart., (P. Dietel in Hedwigia, 1889, page 181); therefore *Puccinia cladophila* must also be referred to *Puccinia hieracii*, as that species is now understood.

PUCCINIA MINUSSENSIS, de Thümen, No. 1430 of de Thümen's Mycotheca Universalis, is, like the preceding, *Puccinia hieracii*, (Schum.) Mart., and is very near the form on *Troximon glaucum* and the same as the form on *Lactuca pulchella* (syn. *Mulgedium pulchellum*), which is an American species nearly related to *Mulgedium Siberica*—the host of de Thümen's present species.

In Saccardo Sylloge, vol. 7, this *Puccinia* is left in specific rank, but the note after the description refers to its connection with *P. hieracii*.

PUCCINIA BIGELOVIÆ, Ellis and Everhart, in N. A. F., No. 2248, has accidentally been named after a wrong host genus. The specimens distributed in North American Fungi are on *Gutierrezia euthamiæ*. The genus *Gutierrezia* is related to *Bigelovia* and it is likely that the fungus will yet be found on hosts in the latter genus, for which reason the authors of the species prefer to let the specific name go unchanged.

Western mycologists would do well, however, to make a series of cultures with the spores of *Puccinia bigeloviæ*, *Puccinia variolans*, Harkness and of *Puccinia variolans*, *var. caulicola*, Ellis and Everhart, to see whether or no these are really distinct. At the same time cultures should be made with the spores of *Puccinia tanaceti*, DC.,* to which they seem to be too closely related, to see again whether they are distinct from that species, for, after a careful study of a large and varied supply of material and the accurate sketching of spores of each form, their validity is left much in doubt. Properly conducted cultures alone can positively decide the question.

PUCCINIA ELLISIANA, Thüm., in Bulletin of the Torrey Botanical Club, Vol. VI, p. 215, is now regarded by Mr. Ellis, Professor Farlow, and others to be the same as *Puccinia andropogonis*, Schweinitz, which has the right of priority.

PUCCINIA WINDSORIÆ, Schw., VAR AUSTRALIS, n. var. (*Puccinia Dochmia B. and C.*, North Pacific Expl. Exped., No. 131, and *Puccinia Palmeri*, Scribner in herb.) On grass leaves, apparently *Muhlenbergia*, Nicaragua, Central America; C. Wright coll. No. 131, N. P. Expedition; also on *Muhlenbergia* sp., Mexico; collected by Dr. Ed. Palmer, 1886.

Hypogenous or sparingly amphigenous. Sori small, rather more pulvinate than in the species, owing to the long spore pedicels, irregularly disposed, linear or oblong, more or less confluent, but rarely so in straight lines, the ruptured epidermis scarcely or not at all evident. Uredospores subglobose, obovate to oblong-ovate, brown, tegument somewhat thickened; epispore more or less distinctly echinulate, 16–25 by 20–26; teleutospores obovate, broadly elliptical to subglobose, the two last forms predominating; from pale to deep chestnut brown, usually darkest at the thickened vertex; little or not at all constricted at the septum, obtusely rounded or occasionally bluntly apiculate, 16–30 by 23–36 μ; pedicel pale brown to subhyaline, 75–125 μ long, by 3 to 6 μ thick at the base of the spore. Differs from the species in the very marked preponderance of the subglobose form of teleutospores and in the very long slender pedicels. A form almost the same as this occurs in the District of Columbia and in Florida. This form again is linked to the various forms of the species as they occur in different northern States. The description of the species itself should be a little more modified in order to embrace the usual, but not the glaring variations. It is also to be noted that in the variety as well as in the species the spores are often more or less obliquely to vertiseptate and the pedicels often to all appearances come from the side instead of from the base of the teleutospore.

In Saccardo's Sylloge, Vol. VII p. 770, are given brief descriptions of *Triphragmium clavellosum*, Berk., and *Triphragmium Thwaitesii*, B. & Br. The former occurs in America on *Aralia nudicaulis*, and is said (l. c.) to occur also in Ceylon on *Paratropa terebinthinacea*, *Hedera* and *Amygdaleæ* species. The latter is given for Ceylon as occurring on *Hedera Vahlii*, and the question is asked whether it is not the same as

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*A careful study should also be made of *Puccinia tanaceti* DC. var. *Actinellæ* Webber on *Actinella acaulis*. If this is a good variety, then perhaps some others now included in the species, should be regarded in the same light. Anders.

T. clavellosum. I have not been able to secure Ceylon specimens referred to *T. clavellosum*, but it is quite likely that all such are referable to *T. Thwaitesii.* Of this latter I have secured an authentic specimen from Mr. J. B. Ellis, to whom it was sent by Dr. M. C. Cooke, of London, England. As *T. clavellosum* and *T. Thwaitesii* are related species it is easy to understand why confusion should arise concerning them, especially when we consider the meager published description in which spore measurements are entirely omitted. *T. Thwaitesii* is a quite distinct species from North American forms of *T. clavellosum*, and it is pretty safe to say that *T. clavellosum* is American and that *T. Thwaitesii* is Asiatic. I have, in the following, drawn up full descriptions of the two species. For the description of *T. clavellosum* I selected No. 844 of De Thümen's Mycotheca Universalis on *Aralia nudicaulis*, collected in the Adirondack Mountains, New York, by Ch. H. Peck. For the description of *T. Thwaitesii* I used the small specimen sent me by Mr. Ellis.

TRIPHRAGMIUM CLAVELLOSUM, Berk.

Epiphyllous; sori small, roundish-orbicular, or elliptical, surrounded by the ruptured epidermis and distinct, or as often confluent into apparently one large sorus, a quarter of an inch across, growing on more or less well defined spots. Uredospores not seen; teleutospores 30–40μ long by 16–30μ wide, globose to obovate or oblong in outline, the margin frequently not at all lobed, dark brown to almost black, epispore thickened and with numerous stout somewhat tapering appendages, the tips of which are emarginate, bifurcate, or even quadrate with four hyaline recurved lobes; pedicel at least as long as the spore, usually longer, 40-100 by 5-10μ thick at junction with base of spore, average size about 50μ long by 6μ thick, not much tapering and somewhat roughened. On *Aralia nudicaulis.*

TRIPHRAGMIUM THWAITESII, B. & Br.

Amphigenous, but most abundant on the upper surface of leaf; sori small, roundish, rarely confluent, growing on well defined irregular patches, which are blackish above and paler below. Uredospores (?) 28–35 by 30–50μ, oval to obovate, rather dark yellowish brown, epispore thickly beset with sharp awl-shaped spines about 3μ long; pedicel about length of spore, hyaline; teleutospores 30–60μ long by 27–59μ wide, globose to obovate outlined, more or less perfectly and uniformly three-lobed, often truncate at the apex, light brown to dark chestnut brown; epispore rather thick, appendages few, straight and tapering, expanding at the end into an emarginate and often distinctly bifurcated tip; pedicel about the length of the spore, seldom longer, slightly roughened, tapering to the slender and usually curved point, about 5μ thick at junction with base of the spore. It is possible that the uredospores described in the foregoing may belong to something else, as I only found two spores and they were mixed in with teleutospores. On *Hedera*, (?) Ceylon.

UROMYCES AMYGDALI, credited to Cooke in report on Insect and Fungous Pests, No. 1, by Henry Tryon, issued by the Department of Agriculture, Queensland, Australia, is doubtless *Uromykes amygdali*, Passer.; see the above report, page 97, Leaf Rust and Shedding of Foliage (*Uromyces amygdali*). At any rate this "*Uromyces*" turns out to be the uredo of *Puccinia pruni*, Pers. (See also Sacc. Syll. vol. VII, p. 648.) A series of excellent specimens has been received by the Division of Vegetable Pathology from two points in South Australia, collected on peach, plum, apricot, and almond leaves by Mr. F. S. Crawford and Mr. R. H. Simons. In some of these specimens the teleutospores have developed, and are present in great numbers in the same sori with the uredospores. They agree in every particular with specimens of *Puccinia pruni*, Pers. on peach and plum hosts in the United States.

UROMYCES SOPHORÆ, Peck, in Bulletin Torrey Bot. Club, Vol. XII, No. 4, p. 35, and *Uromyces hyalinus*, Peck, in Bot. Gaz. 1878, p. 34, are identical, and both again referable to the widely dispersed and consequently somewhat variable *Uromyces trifolii*, (Hedew.) Léveillé.

ENTYLOMA CRASTOPHILUM, Sacc., and ENTYLOMA IRREGULARIS, Johanson, are the same species, judging from the two specimens in the Herbarium of the Division of Vegetable Pathology—Krieger, Fungi Saxonici, 202; *Entyloma crastophilum*, Sacc. (Michelia I, p. 540, September 15, 1879), on *Agrostis?* W. Krieger leg; and Eriksson, Fungi Parasitici Scandinavici 259; *Entyloma irregularis*, Johanson, on *Poa annua*, C. J. Johanson coll. In the former specimen the spores are more angular than in the latter; the color is almost the same and the measurements of both are the same. As I make them, the measurements are 6–10 by 8–20μ, but rarely over 16μ long.

Saccardo's description was published first, hence *Entyloma crastophilum*, Sacc, has precedence.

USTILAGO SUCCISÆ, Magnus, *U. scabiosæ*, (Somer.) Wint. and *U. intermedia*, Schroeter, as given in Saccardo's Sylloge, vol. VII, p. 475 and 476, appear to be one species. They all occur in the anthers of *Scabiosa columbariæ* and *Scabiosa arvensis*: the name, *Knautia arvensis*, given in the Sylloge, is simply the old name of *Scabiosa arvensis*. *Ustilago intermedia* only differs from the other forms in its darker and more evidently reticulated spores, and does not seem to be more than a variety of *U. scabiosæ*, to which the other forms should be referred, and it is doubtful whether it deserves even varietal rank.

The notes now following were made directly from Berkeley & Curtis's type specimens in the Herbarium of the U. S. North Pacific Exploring Expedition under Commanders Ringgold and Rogers, 1853–'56. C. Wright collected the specimens.

PUCCINIA KAMTSCHATKÆ, Anders., n. s. On *Rosa* species, collected by C. Wright at Petropaulovski, Kamtschatka. Description drawn up from specimen in the herbarium of the United States North Pacific Exploring Expedition under Commanders Ringgold and Rogers, 1853–'56. Specimens labeled "*Coleosporium pingue*, Lév. ?"

Amphigenous, but most abundant on lower surface of leaf where the sori are confluent and irregularly effused; on the upper surface the sori are usually small, fewer, and less often confluent; surrounded more or less perfectly by the much lacerated and conspicuous epidermis: in the effused patches irregular lines of this epidermis stick up here and there, marking more or less plainly the boundary of several or many irregularly confluent sori. Sori rather large, variable in outline, not definitely arranged, becoming pulverulent; light snuff-colored. Uredospores globose, short ovate, obovate to oblong elliptical, smooth or slightly roughened, pale yellowish brown to light brown; epispore one-half to almost 3μ thick, but little or not at all thickened at the vertex, 13–27 by 13–30μ. Teleutospores oblong, ovate, oval to broadly elliptical, segments generally divided equally, usually not much constricted at the septum; vertex broadly rounded or occasionally narrowed, but not apiculate; epispore as thick as that of the uredospores, smooth or somewhat roughened, frequently a little thickened at the vertex, light brown, 13–37 by 20–54μ; pedicel stout, but fugaceous, yellowish hyaline, once to twice the length of the spore; paraphyses intermixed with the spores, pedicel-like, cylindrical, a little or not at all swollen at the rounded apex.

The general appearance of this Puccinia *en masse* is that of the uredo stage of *Phragmidium subcorticum*, (Schrank). It thickens and changes the shape of the leaf just as that does, and without a microscopic examination would be passed over as *Phragmidium subcorticum II*, turned snuff brown. *Coleosporium pingue*, Léveillé, is merely the uredo of *Phragmidium subcorticum*. It is more than likely that *Puccinia Kamtschatkæ* will be found by careful seekers on various *Rosa* forms in the northern Rocky Mountains and along the northwestern coast of America.

PUCCINIA TRIARTICULATA, B. & C. Herbarium of the North Pacific Exploring Expedition, No. 130. Collected by C. Wright on *Elymus mollis*, Arakamtchetchene Island, Behring Straits. The original description is not complete, lacking spore measurements and other notes of value. We may expect to find this species in Alaska and along the northwestern coast of America generally. The following more complete description has been drawn up from a type specimen: Sori linear to narrowly oblong, buried in the tissue, but forming a pustule on the surface of the host, finally bursting the epidermis and presenting a level dark-brown surface. Uredospores ? Teleutospores two to three septate, 60–100 by 12–24μ; pale brown, elongated, oblong, narrowly cuneate or cylindric-clavate, with an ovate, or rounded, or more or less obliquely truncate apex, constricted at the septa or not; epispore thin, smooth, vertex frequently thickened; pedicel short, stout rather dark reddish brown, strongly contrasting with the pale color of the spore, 5–9 by 5–14μ, and rather firmly attached to the dense parenchymatous stroma, which, like the pedicel, is reddish brown. This peculiar species is rather a doubtful Puccinia.

PUCCINIA SEPULTA, B. & C. Herbarium North Pacific Expedition, No. 131, on leaves of *Ficus?* Nicaragua, Central America. C. Wright, collector.

Hypophyllous, spots orbicular, brown on both sides, but more definitely outlined on the upper; bullate above, concave beneath; sori congested in a uniform mass and more or less perfectly covered by the host hairs adherent to the epidermal fragments protruding from between the crowded sori. Uredospores? Teleutospores 23–75 by 13–27, brown and smooth, extremely variable in size and shape, narrowly oblong and much elongated, or broadly clavate, obtusely elliptical, obovate, cuneate to broadly subturbinate; constricted at the septum, or not; apex subtruncate, or variously rounded, sometimes narrowed, usually thickened, lower segment quite often narrow and distinguishable only from the broad and often somewhat swollen pedicel by the septum at base, where it is often constricted; pedicel narrow or broad, frequently swollen above, but constricted at junction with the spore, less than twice the length of the spore, brown, or dilute brown, often coming from one corner of spore base instead of the center. Occasionally three-celled spores are seen, and even two perfectly formed spores normal in size are found, the base of the upper joined closely to the apex of the lower by about the width usually occupied by the pedicel; or, two spores may be joined laterally by a small surface of the upper segments, the lateral spore having no pedicel of its own, and again, the upper segment also of an individual spore is sometimes vertically septate, showing an inclination towards *Triphragmium.*

UREDO BAUHINIÆ, B. & C. Fungi North Pacific Expedition, No 138. C. Wright, coll., on *Bauhinia* sp.

Amphigenous, but more sparing above. Spots small, yellowish, or quite obsolete. Sori small, roundish, or orbicular, scattered, rarely confluent, dark reddish brown, the ruptured epidermis more or less evident; spores globose, broadly obovate or broadly and obtusely elliptical, echinulate, reddish fuscous, 26–30 by 26–33μ, epispore 3–5μ thick; pedicel 20–30μ long, hyaline and fragile.